

# **FACTORS INFLUENCING INFANT MORTALITY IN URBAN KENYA**

**By  
IRENE KITTUR  
(Q50/68606/11)**

**A PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE AWARD OF A MASTER OF ARTS DEGREE AT  
THE POPULATION STUDIES AND RESEARCH INSTITUTE, UNIVERSITY  
OF NAIROBI**

**NOVEMBER, 2014**

## DECLARATION

This research project is my own original work and has not been presented to any other university for an award of a degree.

**CANDIDATE: IRENE J. KITTUR**

Sign.....

Date .....

This research project has been presented for examination with our approval as University Supervisors.

**PROF. JOHN O. OUCHO**

Sign .....

Date .....

**DR. ANDREW K. MUTUKU**

Signature.....

Date.....

## **DEDICATION**

**To my great parents and siblings;**

Thank you for your constant encouragement, support and unfailing love and above all to the Almighty God who has always turned all my challenges to opportunities of growth.

## ABSTRACT

Infant mortality in Kenya varies by type of place of residence. In urban Kenya, it declined in the mid-1990s but later increased substantially by late 1990s. A decline in infant mortality was also noted in the early 2000s, however by late 2000s an unexpected increase was observed..Several gaps have been noted from previous dichotomous studies, in urban Kenya. Studies have shown inconsistencies on the effect of infant mortality by various factors such as ; work status, wealth quintile while birth order and birth spacing . This study sought to establish factors influencing infant mortality in urban Kenya.

It examined three objectives; the effect of socioeconomic, maternal and environmental factors on infant mortality in urban Kenya. The study utilized Kenya Demographic and Health Survey data (KDHS) of 2008/9.Descriptive statistics and Cox proportional Hazard model were the main methods of data analysis.

Bivariate findings showed that birth order and preceding birth interval were significantly associated with infant mortality in urban Kenya. The multivariate analysis indicated that wealth index and birth order were the determinants of infant mortality in urban Kenya.

The main policy implication is need to roll out The National Urban Development Policy in all urban areas in Kenya. Future research should focus on undertaking studies on infant mortality in urban areas using qualitative methods and also factors influencing infant mortality in different urban settings such as non-slum, slum and peri-urban.

## ACKNOWLEDGEMENT

I am grateful to the many people who in different ways contributed to the successful completion of this project. I deeply acknowledge the able guidance of my two University supervisors namely; Prof. John O. Oucho and Dr. Andrew K. Mutuku for their insightful suggestions, comments and constructive criticisms during the writing of this project. Their tireless effort enabled me to successfully complete this project.

I will forever be grateful to, all my lecturers at PSRI, Prof. Lawrence Ikamari, Prof. Alfred Agwanda Otieno, , Prof. Murungaru Kimani, Dr. Wanjiru Gichuhi, Dr. Anne Khasakhala, Dr. George Odipo and Mr. Ben Jarabi . Special thanks to my classmates and fellow students (Masters and PhD) at Population Studies and Research Institute for their generous support throughout the course and to all who contributed to the success of this study. My gratitude also goes to the staff at PSRI library and administration for their invaluable support and being readily available to help whenever needed. I am also wholly indebted to my family and friends for their unconditional support and encouragement throughout my academic life. God bless you all.

## TABLE OF CONTENTS

DECLARATION .....	ii
DEDICATION .....	iii
ABSTRACT.....	iv
ACKNOWLEDGEMENT .....	v
TABLE OF CONTENTS .....	vi
LIST OF FIGURES.....	ix
LIST OF TABLES .....	x
LIST OF ACRONYMS AND ABBREVIATIONS.....	xi
CHAPTER ONE .....	1
INTRODUCTION.....	1
1.1 Background .....	1
1.2 Problem Statement.....	3
1.3 Objectives of the study .....	4
1.4 Justification of the study .....	5
1.5 Scope and Limitation of the Study .....	6
CHAPTER TWO.....	8
LITERATURE REVIEW .....	8
2.1 Introduction.....	8
2.2 Theoretical Perspective.....	8
2.3 Socioeconomic Determinants .....	11
2.3.1 Maternal Education.....	11
2.3.2 Wealth Quintile .....	13

2.3.3 Mother’s Work Status .....	14
2.4 Maternal Factors.....	14
2.4.1 Mothers Age at first Birth .....	14
2.4.2 Birth Order .....	15
2.4.3 Preceding Birth Interval .....	16
2.5 Environmental Factors.....	18
2.5.1 Availability of Pit Latrine / toilet .....	18
2.5.2 Source of Water .....	19
2.5.3 Summary of Literature Review .....	19
2.6 Conceptual Framework.....	21
2.7.1 Operational Hypotheses .....	24
CHAPTER THREE.....	26
DATA AND METHODOLOGY .....	26
3.1 Introduction.....	26
3.2 Data Source .....	26
3.3 Data Quality .....	27
3.4 Methods of Data Analysis.....	28
3.4.1 Descriptive Statistics.....	28
3.4.2 Cox Proportional hazard model.....	28
CHAPTER FOUR .....	32
FACTORS INFLUENCING INFANT MORTALITY .....	32
4.1 Introduction.....	32
4.2 Background Characteristics of study population .....	32

4.3 Differentials of infant deaths in urban Kenya .....	36
4.4 Factors influencing infant mortality in urban Kenya .....	38
CHAPTER FIVE.....	43
SUMMARY, CONCLUSION AND RECOMMENDATIONS .....	43
5.1 Introduction.....	43
5.2 Summary of findings .....	43
5.3 Conclusion .....	44
5.4 Recommendations .....	46
5.4.1 Recommendations for policy makers .....	46
5.4.2. Recommendations for further Research.....	47
REFERENCES.....	48



## LIST OF FIGURES

Fig 2.1: Conceptual Framework (Mosley And Chen 1984) .....	22
Fig 2.2: Operational Framework.....	23

## LIST OF TABLES

<b>Table 2.1 Variables and their measurements .....</b>	<b>25</b>
<b>Table 4.1: The percentage distribution of study population according to the study variables, in Urban Kenya, 2008/9 KDHS .....</b>	<b>34</b>
<b>Table 4.2: Differential on infant deaths according to the study variables, in urban Kenya, 2008/9 KDHS .....</b>	<b>37</b>
<b>Table 4.3: Results of multivariate Cox's regression for factors influencing infant mortality in urban Kenya .....</b>	<b>40</b>

## LIST OF ACRONYMS AND ABBREVIATIONS

<b>ART-</b>	Antiretroviral therapy
<b>ARVS-</b>	Antiretroviral
<b>HF-</b>	Hazard Function
<b>KDHS-</b>	Kenya Demographic Health Survey
<b>MICS-</b>	Multiple Indicator Cluster Survey
<b>MLE-</b>	Measure Learning and Evaluation
<b>NCPD-</b>	National Council for Population and Development
<b>NUDPK-</b>	National Urban Development Policy for Kenya
<b>NSUPPK-</b>	National Slum Upgrading and Prevention Policy for Kenya
<b>PSRI-</b>	Population Studies and Research Institute
<b>ROK-</b>	Republic of Kenya
<b>SPSS-</b>	Software Package for Social Science
<b>UNICEF-</b>	United Nations Children Fund
<b>UN-</b>	United Nations
<b>WFS-</b>	World Fertility Survey
<b>WHO-</b>	World Health Organization

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

Infant mortality is often an indicator of the socio-economic development of a country, since infants, more than any other age group of population; depend heavily on the socio-economic conditions of their environment for their survival. The gains in infant mortality are just one element of a wide set of improvements in human welfare in Kenya, (Demombynes and Trommlerovia, 2012).

According to Kenya Demographic Health Surveys, infant mortality rate in Kenya, fell from 119 deaths per 1000 live births in 1969 to 88 and 66 in 1979 and 1989 but there was an increase in 2003. Infant mortality was at 77 deaths per 1000 live births, in 2008/9 it dropped to 52 deaths per 1000 live births . In one review of these changes, (Radelet, 2010) argues that five fundamental factors could have brought out these changes; among these is a more democratic government, sensible economic policies, new technology and generation of policy makers' activists. Accompanying these changes has been push by government and international communities to implement major public health initiatives. These include Global Fund and Gates foundation to fight malaria, HIV/ AIDS, improve water and sanitation among others.

According to the 2009 Kenya Population and Housing census, its population was enumerated at 38.6 million .The trend data from population census indicates that the total population tripled between 1969 and 1999.It also clearly shows that the population was increasing by 1 million people yearly as reflected from 1999 to 2009 when the population was estimated to be increasing by 2.9 percent per annum (NCPD,

2012). Rural to urban migration has resulted in urban growth, stimulated by economic disparities between geographical areas in Kenya and is driven primarily by the search of employment and settlement. Rapid urbanization may also be attributed to boundary changes and reclassification of small agglomeration.

The emerging urban setting however is characterized by a radical process of change with negative and positive effects. In particular there have been increased inequities, greater negative environmental impacts, expanding metropolitan areas and fast growing slums. The continued high rate in urbanization has led to problems as increased urban poverty and inadequate services especially among the poor. 1 out of 3 Kenyans live in urban centers, as a result, local and national authorities have not been able to provide decent living conditions and basic social services sufficient to meet the needs of such a growing urban population. Emerging evidence reveals that the urban population explosion in the region has been accompanied by increased rates of poverty and poor health outcomes as a result the incidence of infant and child morbidity and mortality has been shown to be higher in urban areas and more so in slums and peri-urban areas than in more privileged urban settings,(Fotso,2011).

According to Kenya Demographic Health Surveys infant mortality rate in urban Kenya was at 56.8 deaths per 1000 births in 1989, in 1993 it reduced to 45.5 deaths per 1000 births, in 1998 it was at 64.9 deaths per 1000 births, a decline was noted in 2003 to 61 deaths per 1000 births and in 2008/9 it increased to 63 deaths per 1000 births.

Several policies have been put in place like the National Urban Development Policy for Kenya envisaged to strengthen governance, development planning, urban

investment and delivery of infrastructure services and also economic sustainability which will contribute towards poverty reduction, economic growth and further realization of Kenya's vision 2030, (Institute of Surveyors, 2012). Another policy put in place, is the National Slum Upgrading and Prevention Policy aimed to provide planning, development control, environmental care, shelter and housing, security, infrastructure, legal and governance service, improvement in socioeconomic conditions and land tenure system, (ROK, 2013).

These policies will be helpful in improving living conditions in urban Kenya, as improved socioeconomic factors and environmental factors will reflect a change in health conditions and importantly reduce infant and child mortality. Thus this study focused on factors influencing infant mortality with a view to establish current infant mortality in urban Kenya.

## **1.2 Problem Statement**

Kenya has enjoyed an impressive and sustained decline in infant mortality, in the last decade, its infant mortality declined by 32% and it was noted to be one of the most rapid in sub-Saharan Africa (NCPD, 2012). These improvements are widely attributed as resulting from governments' improvement in services and various targeted new public health initiatives that have improved maternal health and improved access to water and sanitation, (Agwanda et al, 2012 & Demombynes and Trommlerova, 2012). However infant mortality in Kenya varies by place of residence. Urban Kenya has shown a declining trend in infant mortality in the last one and a half decade. This decline was attributed to improved access and uptake to HIV related services as

ARVS and prevention from mother to child services and improvement in preventive and curative services for diseases as malaria (Fotso, 2011 and Murage, 2012).

However in the last decade the country witnessed an increase in infant mortality this was attributed to rural- urban migration in big cities and towns resulting to growth of informal settlements which account at 70% in the country's total population and is characterized by poor living conditions including poor water and environmental sanitation, poor livelihood and health opportunities and has resulted in deteriorated living conditions leading to prevailing low standards of living and raised living standards which has risen cost of protein rich food rendering urban poor malnutrition and susceptible to infection. Studies have shown that breakdown of social and cultural norms which regulates child birth and care has resulted in reduced intervals between births and corresponding higher than expected levels of infant mortality. Previous dichotomous studies in Kenya according to type of residence found that in urban Kenya there are inconsistencies in work status and wealth quintile and its influence on infant mortality and birth order after two are only significant and its effect on infant mortality are mixed while for birth spacing conflicting results have been noted (Murage & Agwanda et al, 2012; Kimani 2012; Fotso 2007; Mustafa & Odimegwu 2008). Thus this study focused on factors influencing infant mortality in urban Kenya?

### **1.3 Objectives of the study**

The general objective of this study was to establish the factors influencing infant mortality in urban Kenya. The specific objectives were:

1. To establish the effect of socioeconomic factors on infant mortality in urban Kenya.
2. To establish the effect of maternal factors on infant mortality in urban Kenya.
3. To establish the effect of environmental factors on infant mortality in urban Kenya.

#### **1.4 Justification of the study**

This study makes a contribution in two ways. First it contributes to a better understanding of factors behind the increase of infant mortality in urban Kenya. In Kenya reducing infant mortality is one of the country's targets in a bid to improve human welfare and improve development. It's one of the components of United Nations Development index and it is very important as it's used for evaluation and planning of public health strategies (UN, 2007).It is also of importance to the government in a bid to achieve millennium goal of reducing infant and child mortality by two thirds and also in the countries goal of reducing mortality so to achieve vision 2030.

Current data has shown that according to type of residence infant mortality has been higher and is increasing in urban Kenya. The factors influencing high mortality in urban Kenya is not well understood. From the literature reviewed inconsistent results has been seen especially in wealth index and work status and its influence on infant mortality while for birth order and spacing the findings are mixed and conflicting , these gaps can only be filled with a study on infant mortality in urban Kenya.

Secondly, a comprehensive understanding of factors influencing infant mortality in urban Kenya and knowledge from the study will be useful to researchers, policy



makers and program managers in designing better policies and programmes to address the challenge of increasing infant mortality in urban Kenya. Thus this study is important because the prevention of high infant mortality rate has been and remains a major pre-occupation of health authorities in Kenya and the degree of success of health programs could be ascertained on the basis of observable decline in infant mortality.

### **1.5 Scope and Limitation of the Study**

This study focused on factors influencing infant mortality in urban Kenya. The main data used was obtained from the Kenya Demographic Health Survey 2008/9 data. This survey shows data on following information fertility, mortality, socioeconomic, health (diseases) and environmental factors. The study focused on infants of a sample size of 1467 births and a sample included a study population of 8444 women of ages 15-49 who provide information on the infants and the study used a child file to get relevant information on infants.

There are several limitations inherent this includes: the quality of misreporting at age of death which distorts the age pattern of mortality. Also another problem is the selective omission from the birth histories of record of infants who did not survive which could lead to underestimation of mortality. Findings show that infant mortality is higher in informal settlements that is slum areas at about 91 deaths per 1000 births compared to non-slum which is very low at less than 10 deaths per 1000 births other peri-urban areas is at 57 deaths per 1000 births(Alampay,2008).

However, the 2008/9 KDHS data does not show data in disaggregate manner for urban Kenya in that into peri-urban, non-slum and slum areas thus it is difficult to

understand how each comes out in relation to infant mortality. However regarding these shortcomings this study addressed them in section of data quality in chapter three.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter presents a review of literature on infant mortality in urban Kenya. The first section focuses on theoretical perspective, the second part looks at the major socioeconomic, environmental and maternal factors influencing infant mortality in urban Kenya; and the third part looks at the conceptual and operational framework and the last part looks at the summary of the literature review.

#### **2.2 Theoretical Perspective**

Theoretical perspective presents insights on various schools of thoughts that guide the thinking on infant mortality. The theoretical perspective highlights the postulate of Omran (1971), on Epidemiological transition theory and Thompson (1929) on Demographic transition theory.

First, Thompson (1929) argued that population goes through three stages in their transition to modern pattern, the second stage is the stage of transition where mortality and fertility is declining and is explained in terms of economic development and is majorly influenced by urbanization and industrialization. Kenya features in this stage, it is experiencing increase in population this is due to population explosion resulting from decline in mortality due to decline in death rates. This is largely as a result of improvement in food supply and improvement in public health strategies which reduce mortality especially childhood. There is increased child survival which has resulted in growing population hence age structure of population is basically youthful.

It has been noted that Kenya is one of the countries having a massive decline in infant mortality this has resulted from improved public health initiatives.

Second, Omran attempted to account for the extra ordinary advances in healthcare which were made in industrialized countries. He postulated that all countries experienced three stages in the process of modernization. Stage two comprises age of receding pandemic where life expectancy moves from under 30 to over 50. Kenya features in this stage its mortality pattern has reduced over the years be it adult and child mortality. Through agriculture, improved nutrition has been noted hence infant mortality has reduced especially in rural Kenya and at national level. Efficiencies in transport has helped in reversing infectious diseases making chronic diseases prevalent .However economic challenges restrict family size, while births and deaths have not reached an equilibrium thus population has continued to increase.

Magoha, (2012), in his study of twelve countries on level of life expectancy , he noted that Kenya as of 2012, had a life expectancy of 64 and this substantial improvement shows that Kenyans can expect to live longer. In his study he further noted that factors leading to early deaths and reduced life expectancy included poor health which contributed majorly to infant mortality, poor living conditions and extreme poverty which affects quality of life.

These two theories contribute greatly to the study of infant mortality in urban Kenya. Kenya is seen to be at the second stage in each theory and both stages are characterized by decline in mortality. Over the years mortality in Kenya has generally declined and this has been attributed to improvement in services and

various targeted public health initiatives, improved maternal health and improved access to water and sanitation. Further uptake of ART services, reduction in stigmatization and uptake of preventive and curative services have reduced the impact of HIV/AIDS and increased life expectancy (Murage and Agwanda et al, 2012). However mortality has been declining in rural areas and at national level, but its actually increasing in urban Kenya, this is unexpected since urban areas being centers of development are expected to have better healthcare and better sanitation especially compared to rural areas.

Fotso (2011) noted that between 1998 and 2009, the number of people in urban areas in Kenya has increased, while local and national authorities have not been able to provide decent living and social conditions to measure up to the growing population. This growth in urban population has been accompanied by increased poverty and poor health outcomes. Several factors have attributed to increase in infant and child mortality as child under nutrition due to poor feeding practices and lack of growth monitoring and promotion. Poor sanitation due to faecal contamination and poor hygiene has resulted in early infections among infants being one of main cause of deaths in urban Kenya.

Omran's theory of epidemiological transition had one major shortcoming; it did not envisage a decline in man-made diseases due to policies that facilitated improved medication and further decline in other diseases as the Aids pandemic triggered, decrease in life expectancy. This theory is more favorable in explaining mortality at the continental level than at country and especially at a specific place as type of residence like urban areas, (Weisz and Jesse, 2009). Looking at demographic

transition theory, Thompson failed to consider cultural variables and its hypothesized relationship between population growth and economic development. He assumed development of non-western countries would follow that of western countries (Lee, 2003)

## **2.3 Socioeconomic Determinants**

Socioeconomic determinants influence infant mortality rate in urban Kenya. Socioeconomic determinants were looked at in more aspects as maternal education, work status of the mother and wealth quintile.

### **2.3.1 Maternal Education**

Kabir and Uddin (2006) established that in urban Bangladesh, infants of mothers with no formal education were 1.32 times more likely to die before their first birthday than mothers with secondary education and above. A study conducted in forty five countries in urban areas in low and middle income countries using the demographic survey 2000-2009 found that maternal education influenced infant mortality and it reduced with increase in level of education.

1 out of 14 infants died in urban Pakistan and further mothers with secondary plus education had a lower infant mortality rate compared to those with no education and primary level of education. In urban Turkey and Latin America, maternal education was a powerful explanatory variable in influencing infant mortality and those mothers with secondary and above education experienced lower infant mortality compared to those with primary and no education, (Gyrsoy ,2005).

While in urban Bolivia, maternal education had a strong influence on infant mortality through reproductive and other proximate determinants. It was seen that educated mothers beyond secondary level had a better feeding practices and were aware of importance of health provision as immunization to their infants compared to mothers who had no education or just primary level (Aguirre, 2005).

A study conducted in Kenya, Senegal, Nigeria and India on neighborhood differentials in infant and child mortality in urban settings using the Measurement, Learning and Evaluation Survey, in ten years prior to the survey, infant mortality was higher in urban than rural areas, this was attributed to increase in informal settlements in urban areas as a result poor socioeconomic conditions resulted in poor health conditions especially among mothers and children and low education levels among mothers resulted in poor infant and child feeding practices(MLE, project 2010).

Generally irrespective of type of residence, education of women while controlling for other correlated factors in general, showed an inverse relationship with infant and child mortality. Further mortality differentials in Africa are obviously as a result of differences in socio-economic development among different regions. Using female education level to explain the infant and child mortality differential among the different regions of Africa, there is a contrast between the figures for higher mortality countries of West Africa (Gambia, Mali and Sierra Leone) where only a small minority of women have received any schooling and those for low mortality countries for Eastern and Southern Africa,( Botswana, Kenya and Zimbabwe) where less than half of the females in the peak child bearing age groups have received any schooling, (Mustafa & Odimegwu, 2008).

### **2.3.2 Wealth Quintile**

Infants in urban Bangladesh from poor families had higher infant mortality of 61 deaths per 1000 births compared to infants born to mothers from rich households at only 14 deaths per 1000 births. This was attributed to poor families not being able to provide necessary food that was important for infant growth and also most of them succumbed to infectious diseases due to poor health and inadequate immunization, (Uddin & Kabir, 2006). The Multiple Indicator Cluster Survey of 2006 (MICS) findings in Egypt reported a rapid decline in infant mortality due to improved economic conditions and most urban homes could access basic needs and healthcare and proper nutrition which helped improve infant and child survival.

The Asian economic crisis affected household wealth index and was a contributory factor to poor households. Countries as India, Philippines, parts of China and Singapore were affected economically and it had an impact on healthcare of children such that child and infant mortality greatly increased.

In some parts of urban areas in sub-Saharan Africa, infant mortality was seen to be higher among mothers from households with high level of wealth quintile.. Instances of early weaning of infants were common and this resulted in early infections on infants because their immunity is lower than infants' breastfed fully, though some studies have shown inconsistencies in wealth quintile influencing infant mortality (Fotso, 2007; Bocquier & Gunther, 2012).



### **2.3.3 Mother's Work Status**

Non-Working mothers in urban Bangladesh experienced higher infant mortality of 77 deaths per 1000 births compared to working mothers at only 45 deaths per 1000 births. This is because working mothers are able to provide basic needs to their young ones, (Uddin & Kabir 2006).

Fotso (2011), found in his studies in urban areas in parts of sub-Saharan Africa that working and non-working mothers established no difference in their influence on infant mortality.

In urban areas of Indonesia many mothers of infants were working class and had low infant mortality because they could provide for their children yet in the poorer parts of the cities, women who worked in industries had less time to care for their infants. These infants were mostly seen to get infectious diseases early and had poor malnutrition because of unqualified care given by older siblings or by care takers who were not experienced, (De Klark, 2002).

## **2.4 Maternal Factors**

Maternal factors which include mother's age at first birth, birth order and preceding birth interval play an important role in influencing infant mortality. These factors contribute in a big way to infant mortality in urban Kenya.

### **2.4.1 Mothers Age at first Birth**

Infant mortality increased with age of mother especially for mothers aged 30 and above in urban Bangladesh. After controlling for demographic correlates as maternal

age at first birth and birth spacing urban advantages are greatly reduced, (Kabir & Uddin 2006; Bocqueir & Gunther, 2012 ).

Rustein (2008), in a cross-national comparative study based on the world fertility (WFS) data drawn from parts of urban developing countries, concluded that the age of the mother parity and child mortality relationship had a U-shaped pattern; mortality risks were highest among children born to very young mothers and those born to older mothers and at first and highest parities. The higher risk of dying among children born to older mothers may be as a result of decline in the efficacy in the reproductive system with age and the economic pressure in the family, while the excess risk at young maternal ages is partly due to physical immaturity, lack of child care skills and access to health care services.

#### **2.4.2 Birth Order**

Singh (2013) noted that in India, birth order had a great influence in infant mortality. Infant mortality increased with increase in birth order, thus birth order 1 and 2 were less likely to die compared to birth order 3,4 and so forth.

The effect of birth order in several studies in urban areas in Kenya were mixed and some showed higher birth order were associated with infant and under five mortality, Kimani, (2012). Birth order plays an important role in probability of infant mortality in Jordan .Infants of birth order one are more likely to survive because they are more likely to capture maternal care and economic advantage. While babies of birth order four and above have a higher incidence of death. This is because their chances of getting care are less compared to first births, (Kaldwei, 2010).

Kaldwei (2010), also noted, while adjusting for a number of socioeconomic factors, infant and child survival is better for those who were of birth order 2-3. Births of very high order may have mothers who are physically depleted at the time of the conception and throughout pregnancy. Their children are thus more likely to suffer from conditions associated with high mortality risks such as foetal growth retardation and low birth weights, than other children.

High order births are also likely to be borne into families who already have many children who compete for resources and parental care. The effects of first order births are likely to be strongest during the neonatal period while the effects of high order births are likely to be strongest at older age, (Mustafa & Odimegwu 2008).

#### **2.4.3 Preceding Birth Interval**

Fotso (2007), noted that short preceding birth intervals are associated with an increase in risk of death for new infants, he used data from urban Nairobi and established that infants born after a preceding birth interval of 36 months are less likely to die than those less than 18 month interval. Births of within 20 months showed an elevated infant mortality rate and he further noted that sub-Saharan African countries including Kenya have yielded conflicting results regarding birth intervals and very few studies are focused on urban areas.

Infant mortality showed a sharper decrease as length of infant mortality increased. Women who spaced births between 3 to 5 years experienced less infant mortality. Studies that have looked at preceding birth intervals have only focused on short or long or looked at actual or preferred birth interval and have not taken time to look at the link between infant survival and health of previous child as predictors of birth

spacing and lengths of preceding birth intervals were predictors of birth spacing in urban Nigeria, Abe and Oladeji, (2013). Short preceding birth intervals in urban Bolivia, of less than 12-24 months impacted heavily on infant mortality, such short preceding intervals increased infant mortality because it had an effect as maternal depletion, sibling competition and risk of cross infection from one baby to another, (Aguirre, 2005).

It is through intermediate biological and behavioral factors that are associated with short preceding birth intervals that lead to higher mortality. A quick succession of pregnancies can have a deteriorious effect on the health status of the mother, and consequently affect the health conditions of the baby during child development in the womb, and this could invariable affect the immunity of the baby and lead to an increased risk of death, also the study found out the probability of infant survival is significantly lower among closely spaced infants, a theoretical pathway explained through the dynamics of sibling competition and maternal depletion syndrome, and that women with closely spaced births may still have very young children that may cause them not to attend prenatal care services besides having a greater probability of giving birth to premature and/or low birth weight babies. The length of birth interval plays an important role on a child's chances of survival, with short birth intervals considerably reducing the chances of survival. Children born fewer than two years after a prior sibling suffer substantially higher risks of death than children with intervals of two or more years, (Mekonina, 2012).

Mekonina, (2012) for infant mortality, the analysis indicates that the longer the birth interval, the lower the risk, even for intervals of 48 months or more. The relationship

between chronic malnutrition and birth spacing is statistically significant in 6 of the 14 surveys using anthropometric data.

## **2.5 Environmental Factors**

According to the World Bank (2000), environmental health risks fall into two broad categories. The first are the traditional hazards related to poverty and lack of development, such as lack of safe water, inadequate sanitation and waste disposal, indoor air pollution, and vector-borne diseases. The second category is the modern hazards such as urban air pollution and exposure to agro-industrial chemicals and wastes that are caused by development that lacks environmental safeguards.

### **2.5.1 Availability of Pit Latrine / toilet**

According to joint UNICEF and WHO (2012) estimates for 2010, 15 percent of people in the world openly defecate without any toilet or latrine; the global impact of poor sanitation on infant and child death and health is profound. Evidence from the history of now-rich countries has demonstrated that complete sanitation infrastructure such as sewage pipes and septic tanks importantly improves health outcomes.

Households with flush toilets in Kenya had an infant mortality of 13 percent and those with pit latrines had 31 percent compared to those without toilet facility, (Mutunga, 2001). A study on changing childhood mortality condition in Kenya, established that there was a 20% increase in risk of infant deaths in households with no toilet facility compared to those with pit latrines, (Omariba, 2005). MICS 2006 findings reported that in urban Egypt, Cairo had improved public sewage system network thus reducing contamination so far this has played a great role in improving infant and child survival.

### **2.5.2 Source of Water**

More than 15 million people including more than half the urban population are without access to safe water or sanitation facilities. Water plays an important role in human lives and influences sanitation, poor sanitation increases the likelihood of diseases. More than 1.4 billion people lack access to safe water, and more than 2.9 billion people have no access to adequate sanitation all of which are essential for good hygiene, (Mutunga, 2007).

Infants born in households with access to piped water or a public tap have an infant mortality rate at 25 percent lower than infants in households using surface water, open wells, lakes and rivers, (Oyugi, 2000). According to World Health Organization, households with piped water were associated with 35% reduction in risk of infant deaths compared to that in a house whose source of drinking water is from a river or stream.

### **2.5.3 Summary of Literature Review**

From the reviewed literature, level of maternal education consistently showed that mothers who have attained secondary and above education have a lower risk of experiencing infant mortality. Wealth quintile showed conflicting findings in that in some studies it was observed that mothers of high wealth quintile had lower chances of experiencing infant mortality because of their ability to provide better care in terms of nutrition and healthcare, though other studies showed that mothers from households of high wealth quintile had higher chances of weaning early which was a major contributing factor in increasing chances of infant mortality.

Work status findings demonstrated inconsistencies, some studies cited that there was a difference in both whether it did or did not influence infant mortality. In another instance it showed that working mothers had lower chances of experiencing infant mortality and yet some cited that non-working mothers had lower chances of experiencing infant mortality.

Maternal factors, birth order revealed that studies carried out on birth orders in urban areas are mixed, some showing higher order having less likelihood of experiencing infant mortality while others show order one has been seen to have less risk of infant mortality. Preceding birth intervals, it was conclusively observed that longer birth intervals have been found to reduce the risk of infant mortality while shorter birth spacing especially of less than two years increased the risk of infant mortality.

Environmental factors showed consistencies in that those households with cleaner water experienced lower risk of infant mortality. Most countries in sub-Saharan Africa and Asia are still grappling with poor sanitation which is affecting their health especially that of infants and children. Availability of toilet showed a great influence in influencing infant mortality.

This section leads to the conceptual framework, which is Mosley and Chen framework which talks of proximate determinants influencing infant mortality which are relevant to the study as maternal, socioeconomic and environmental factor

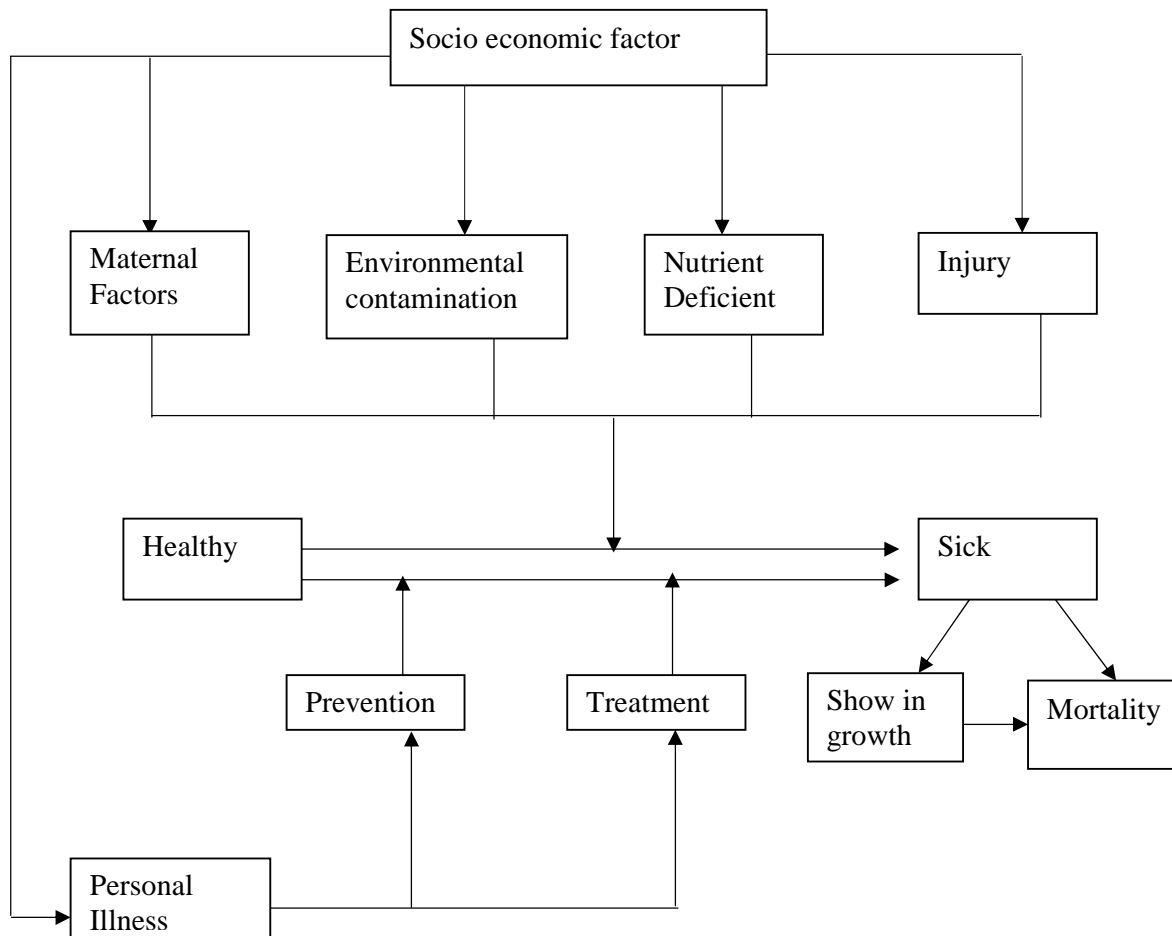
## **2.6 Conceptual Framework**

Several analytical frameworks have been developed to view effects of different determinants on child mortality and morbidity. Mosley and Chen (1984) made distinctions between variables considered to be socio-economic, cultural, community, regional factors; biomedical factors which include hygiene, sanitary measures and nutrition. Effect of socioeconomic variables is indirect and operates through biomedical factors to bring about mortality and morbidity. Biomedical factors are called intermediate variables or proximate determinants because they constitute middle step between exogenous variables and child mortality. Maternal fertility, environment contamination and injury influence the rate at which healthy children become sick. Personal illness control influence incidence of illness through prevention.

Thus this framework (fig 1) formed a base of an important aspect of my study on determinants of infant mortality in urban Kenya. The five groups include maternal factors, environmental contamination, nutrient deficiency, injury and personal illness control. All these factors influence the rate of the incidence of illness through prevention and recovery of illness sometimes if no action is taken it results to death primarily, Mosley and Chen, (1984). However from the conceptual framework it had a limitation in that, not all variables in the framework were used in the study thus this study only operationalized maternal factor, socioeconomic factors and environmental factors.



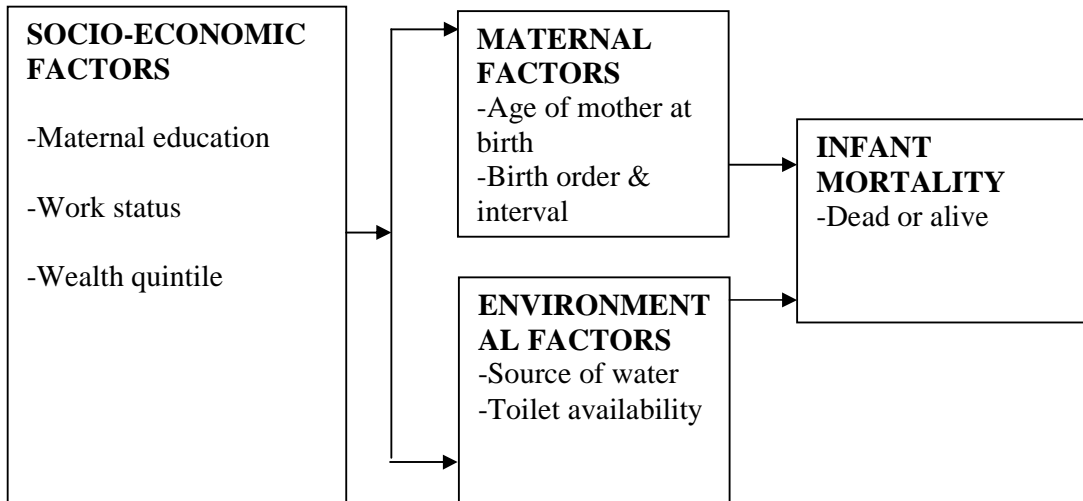
**Fig 2.1: Conceptual Framework (Mosley And Chen 1984)**



**Source: Mosley and Chen (1984)**

**Fig 2.2: Operational Framework**

In the operational framework, (fig 2) this study employed some socioeconomic, maternal and environmental factors. This was relevant in showing the determining factors of infant mortality in urban Kenya.



**Source: Adapted from Mosley and Chen (1984)**

### 2.7.1 Operational Hypotheses

The following are operational hypotheses tested:

- Mothers of secondary education and above have lower risk of experiencing infant mortality in urban Kenya
- Infants born to mothers who are currently working experience low infant mortality in urban Kenya.
- Infants born to mothers who are not working have a high risk of experiencing infant mortality in urban Kenya.
- Safe source of drinking water lowers the risk of infant mortality in urban Kenya
- Availability of toilet reduces the risk of infant mortality in urban Kenya
- Young or older women have a higher risk of experiencing infant mortality in urban Kenya.
- Short birth interval increases the risk of experiencing infant mortality in urban Kenya
- Infants of high birth order have higher chances of experiencing infant mortality in urban Kenya
- Infants born to mothers from households of highest wealth quintile experience low infant mortality in urban Kenya
- Infants born to mothers from households of low wealth quintile experience high infant mortality

**Table 2.1 Variables and their measurements**

<b>VARIABLE NAME</b>	<b>MEASUREMENT</b>
Infant mortality	0=dead 1=alive
<b>Socioeconomic variables</b> Level of education	1=No education 2=Primary 3=Secondary+
Work status of a mother	1=Not currently employed 2=Currently employed
Wealth quintile	1=first 2=Second 3=Middle 4=Fourth 3=Highest
<b>Maternal factors</b> Age of mother at birth	1=15-19 2=20-29 3=30-39 4=40-49
Birth order	1=first birth 2=2-3 3=4+
Birth interval	1=< =24 months 2=>25 months
<b>Environmental factors</b> Source of water	1=Safe source of drinking water 2= Unsafe source of drinking water
Type of toilets	1=Flush toilet 2=Pit latrine 3=No facility

## **CHAPTER THREE**

### **DATA AND METHODOLOGY**

#### **3.1 Introduction**

This chapter presents description of source of data and methods of data analysis.

#### **3.2 Data Source**

The source of data used was the Kenya Demographic Health Survey (KDHS) data of 2008/9. The objective of KDHS is to provide up to date information for policy makers, planners, researchers and program managers. This information seeks to guide planning, implementation, monitoring and evaluating population and health program.

The Kenya National Bureau of Statistics maintains a master sampling frame for household based surveys. The current being used is the fourth National Sample Survey and Evaluation Programme(NASSEP IV), which was developed on a platform of two stage sample design .The 2008/9 KDHS adopted the same design and the first stage involved selecting data selection points(clusters) from national master frame. A total of 400 clusters were selected and the second stage involved systematic sampling of households from an updated list of households,(KNBS&ICF MACRO 2010).

This Study used the birth history of section of women data and specifically the survivorship of the births to a year preceding the survey. The study specifically used data for type of residence that is urban Kenya which has been showing an increase in

infant mortality .The 2008/9 KDHS was a household survey and the sample included 8,444 women of reproductive age and 6079 births in the child file which is a prerequisite in giving the variables associated with infant mortality, of which in urban Kenya 1467 were born and a total 81 died which formed the study sample. The sample drawn was a representative enough to allow for separate estimates for key indicators for the eight provinces (then) in Kenya.

### **3.3 Data Quality**

In Kenya, number of dead children is under-reported in some societies due to socio-cultural beliefs and taboos. There is also evidence that mothers whose children died in the distant past may not recall when their children died and those who were born thus leading to such omissions of births and deaths (Muganzi, 2000).

According to Wangila, (2012), reporting of omitted deaths can be detected by examining ratios of early neonatal deaths to all neonatal deaths. Its expected about 70% of neonatal deaths occur in first six days of life .In DHS surveys the ratio of early neonatal deaths to all neonatal deaths are very high an indication of high data quality or lack of differential reporting of deaths.

Another potential data quality problem is selective omission from birth histories of the record of births of infants who did not survive, this can lead to underestimation of mortality rates .When this problem occurs it is pronounced on early infancy, and it can be detected by examining proportion of neonatal deaths to infant deaths. Severe underreporting will show very low ratio of neonatal deaths to infant deaths, however the Kenya Demographic Health Survey does not display this, its ratios are very high

over 70% thus showing the data is of quality. On the issue of data not being disaggregated, this study has covered it all as one that is urban Kenya.

### **3.4 Methods of Data Analysis**

The study utilized descriptive statistics and Cox proportional Hazard model as the main methods of analysis. These methods are described below.

#### **3.4.1 Descriptive Statistics**

Descriptive statistics was used to show the distribution of the study population by different background characteristics. Frequency distribution was used to measure how often an occurrence of variables and its values occur in a data set of selected variable. Cross tabulation was used to show association between each of dependent and independent variables. Chi square test was used to show statistical significance of the association.

However chi square has limitations in that it just tells us the statistical significance but does not tell us the magnitude thus to achieve that multivariate analysis using Cox proportional hazard model was used.

#### **3.4.2 Cox Proportional hazard model**

A hazard model is a model that defines the risk of instantaneous occurrence of a given risk. This model was developed by Cox in 1972; it is usually stated in continuous form and is fitted by the method of partial likelihood. The proportional hazard assumes that the covariates are multiplicatively related to the hazard and is a commonly used approach for examining time to event data.

The Cox model is semi-parametric and is expressed as a product of a baseline Hazard function (HF) that has an unspecified form, and another factor that is a linear function of a specified number of independent variable which are expressed in exponential form. The baseline hazard is representative of an individual whose covariates or independent variables are zero. It is a proportional model because it is assumed that the hazard for one individual is simply a constant proportion of the hazard of another. Cox regression is considered non-parametric because its base line hazard functions is unspecified hence making it more flexible .The model assumes that the time event and covariates are related. In mathematical notation, the Cox model can be expressed as:

$$X_i(t) = [X_0(t)] e^{(\beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)}$$

In  $X(t) = \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$  (Eq. 1) Where

$$X_0(t)$$

$X(t)$  denotes the hazard function at time  $t$  (probability of a child dying) given the value of the covariates ( $X$ 's) which may either be discrete or continuous.

$B$  represents the vector of co-efficient related to specific predictor variables to be estimated (e.g. maternal education, wealth index).

$X_0(t)$  is an arbitrary, unspecified baseline hazard function. The function is defined when all explanatory variables in the proportional hazard model take a value of zero.

This could be equated to a constant in ordinary least squares regression only that hazard function takes a different value at each time ( $t$ ), for example, in a study, the hazard function will refer to the probability of an infant death at each point in time ( $t$ ) during his or her first year of life with  $k$  (number) of covariates  $x$ .

The hazard function makes it easy to calculate the relative risks of certain groups in relation to specific baseline groups by the exponential of the coefficient. The relative



risk for reference category of each category is unity .Values greater than unity indicate that the relative risk of dying is greater for this group compared to the reference category whereas values less than unity indicate a decrease in the risk, (Pebley & Stupp, 1987).

The regression coefficient decreases the value of hazard function. These coefficients vary around zero .A positive coefficient increases the value of hazard function and thus indicate a negative effect on survival time. A negative coefficient decreases the value of the hazard function and thus indicates a positive effect on survival time. Thus in this study a positive coefficient indicated a greater probability of hazards risk of infant mortality and a negative coefficient indicated a smaller hazards risk of infant mortality.

Corresponding to the very special nature of dependent variable in the hazard model analysis, the SPSS program estimating the model requires that the data on the dependent variable be dichotomous indicating whether or not the event that is death occurred during observation period, and a variable giving either during the time of the event or time of censoring.

In this study, the hazard function which is infant mortality is the response variable while the covariates include socioeconomic, maternal and environmental factors. All variables are time-constant independent variables and do not change in value over time. Shortcoming of this approach is that it is tedious especially if the covariates are many and it is complex in that not all variables may need to be interacted with the

same function of time yet there still remains no clear guidelines on choosing time functions.

At multivariate level of analysis one model was run to establish factors influencing infant mortality in urban Kenya. Eight independent covariates were run against the dependent variable infant mortality. The covariates grouped are:

Maternal factors (*mother's age at first birth, birth order and preceding birth interval*)

Socioeconomic factors (*maternal education, wealth quintile and work status*)

Environmental factors (*type of toilets and source of water*)

For Cox regression one model was derived:

*Model 1:* to establish factors influencing infant mortality in urban Kenya

## CHAPTER FOUR

### FACTORS INFLUENCING INFANT MORTALITY

#### 4.1 Introduction

This chapter presents the results of factors influencing infant mortality in urban Kenya. The first section provides a description of key background characteristics of the study population while the second section describes differentials in infant mortality by key background characteristics. The last section presents results of multivariate Cox proportional hazard regression results.

#### 4.2 Background Characteristics of study population

The results showing background characteristics of the study population based on the study variables are presented in table 4.1. During the five years preceding the 2008/9 Kenya Demographic and Health Survey (KDHS), a total of 1467 infants were reported as live births in urban Kenya. Out of these about (6%) of infants died before their first birthday.

The findings show that majority (47%) of infants were born to mothers with no education while mothers with primary and secondary and above education level had the same number of births (27%). The results further showed that (53%) of births were attributed to currently working mothers while about (47%) of births were attributed to non-working mothers. The proportion of infant births was highest among mothers from households within the highest level of wealth quintile at about (72%)

and lowest among mothers from households within first level of wealth quintile at about (2%), while mothers from households within middle level of wealth quintile had births of about (5%).This implies that number of infant births increased with increase in level of wealth quintile.

**Table 4.1: The percentage distribution of study population according to the study variables, in urban Kenya, 2008/9 KDHS**

<b>Variable</b>	<b>No of infant</b>	<b>Percent n = 1467</b>
<b>Infant mortality</b>		
Dead	81	5.5
Alive	1386	94.5
<b>Highest Education</b>		
No education	685	46.6
Primary	391	26.7
Secondary+	391	26.7
<b>Work status</b>		
Currently working	784	53.2
Not working	683	46.8
<b>Household wealth quintile</b>		
First	27	1.8
Second	43	2.9
Middle	67	4.6
Fourth	279	20.1
Highest	1051	71.6
<b>Maternal Age at first birth (years)</b>		
Less 18 years	417	28.4
18 – 24 years	821	56.0
25 – 34 years	224	15.3
35 +	5	0.3
<b>Birth order</b>		
First birth	512	34.9
2 – 3	640	43.6
4+	315	21.5
<b>Preceding birth interval</b>		
≤ 24 months	230	15.7
> 25 months	1237	84.3
<b>Type of toilet facility</b>		
Flush	546	37.2
Pit latrine	830	56.6
Other and no facility	91	6.2
<b>Source of drinking water</b>		
Safe water	1230	83.8
Unsafe water	237	16.2

*source: analysis 2008/9 KDHS*

The results also showed that majority (56%) of births occurred to mothers who had their first births at age of 18-24 years while the least number of infant births (3%) was observed to have occurred among mothers who had their first births at age of 35 years and above. This implies that women in urban Kenya who were less than 24 years had more births. The highest proportion of births(44%) occurred to mothers who had infants of birth order 2-3, while (22%) of births was of mothers who had births of order 4 and above .The lowest proportion of infant births (5%) was observed among mothers who had first births .Over 84% of births occurred to mothers who had preceding birth intervals of more than 25 months while (16%) of births occurred to mothers of preceding birth interval of less than or equal to 24 months .

Moreover, the findings further showed that the highest proportion of births (57%) were of mothers from households using pit latrines while the lowest proportion(6%) were of mothers from households with no facility or those using other kind of facility. Mothers from households using flush toilets reported (37%) of births. Majority (84%) of births were of mothers from households using a safe source of water while those mothers from households using unsafe source of water had the least number of births at (16%) only.

### **4.3 Differentials of infant deaths in urban Kenya**

The results showing differentials of infant deaths by key background characteristics in urban Kenya are presented in table 4.2. The results show that birth order was significantly associated with infant mortality in urban Kenya. The highest proportion of infant deaths at about (9%) were observed among mothers with births of order 4 and above while the lowest proportion of infant deaths (4%) was observed among mothers who had first births. While mothers who had births of order 2-3 experienced (5%) of infant deaths.

Furthermore, results also showed that preceding birth interval was a significant factor influencing infant mortality in urban Kenya. Majority (7%) of infant deaths occurred to mothers who had a preceding birth interval of less than or equal to 24 months while only (5%) of infant deaths was of mothers who had a preceding birth interval of greater than 25 months. This implies that shorter preceding birth intervals were associated with increased infant deaths.

**Table 4.2: Differential in infant deaths according to the study variables, in urban Kenya, 2008/9 KDHS**

Variable	Urban	
	Dead Percent	Alive Percent
<b>Maternal education</b>		
No education	7.7 (13)	92.3 (155)
Primary	5.7 (39)	94.3 (646)
Secondary+	4.7 (29)	95.3 (585)
	<b><math>\chi^2 = 2.371</math> df = 2 Sig = 0.306</b>	
<b>Work status</b>		
Currently working	5.8 (45)	94.2 (730)
Not working	5.2 (36)	94.8 (656)
	<b><math>\chi^2 = 2.56</math> df = 1 Sig = 0.613</b>	
<b>Household wealth quintile</b>		
First	0 (0)	94.2 (730)
Second	7 (3)	100 (27)
Middle	7.5 (5)	9.3 (40)
Fourth	5 (14)	92.5 (62)
Highest	5.6 (59)	94.4 (992)
	<b><math>\chi^2 = 2.389</math> df = 4 Sig = 0.665</b>	
<b>Maternal Age at first birth (years)</b>		
Less 18 years	7.7 (32)	92.3 (385)
18 – 24 years	4.4 (36)	95.6 (785)
25 – 34 years	5.8 (13)	94.2 (211)
35 +	0 (0)	100 (5)
	<b><math>\chi^2 = 0.328</math> df = 2 Sig = 0.849</b>	
<b>Birth order</b>		
First birth	3.5 (18)	94.5 (950)
2 – 3	5.3 (34)	94.7 (606)
4+	9.2 (29)	90.8 (286)
	<b><math>\chi^2 = 0.328</math> df = 2 Sig = 0.002</b>	
<b>Preceding birth interval</b>		
≤ 24 months	7 (16)	93 (214)
> 25 months	5.3 (65)	94.7 (1172)
	<b><math>\chi^2 = 6.429</math> df = 2 Sig = 0.04</b>	
<b>Type of toilet facility</b>		
Flush	5.1 (28)	94.9 (518)
Pit latrine	6 (50)	94 (780)
Other and no facility	3.3 (3)	96.7 (88)
	<b><math>\chi^2 = 1.427</math> df = 2 Sig = 0.49</b>	
<b>Source of drinking water</b>		
Safe water	76.5 (62)	84.3 (1168)
Unsafe water	8.0 (19)	15.7 (218)
	<b><math>\chi^2 = 1.427</math> df = 2 Sig = 0.49</b>	

source: analysis 2008/9 KDHS



#### **4.4 Factors influencing infant mortality in urban Kenya**

This section presents multivariate Cox's proportional hazard results for factors influencing infant mortality in urban Kenya. This model was fitted by including all factors i.e. wealth quintile, work status, maternal education, maternal age at first birth, preceding birth interval, birth order, source of drinking water and type of toilet facility against the dependent variable infant mortality. The results of the analysis were presented in table 4.3.

The results show that wealth quintile was an important determinant of infant mortality in urban Kenya. Mothers from households within second level of wealth quintile were (82%) less likely to experience an infant death compared to mothers from households within first level of wealth quintile. These findings are consistent with findings from other studies (Kabbir & Uddin, 2006; Oxfam urban program, 2009; Alampay 2008). The studies established that infants born to households within low levels of wealth quintile have a high risk of experiencing infant deaths. This is attributed to the fact that prices of basic subsistent goods are very high hence reducing the purchasing power of urban incomes. Most of these households cannot afford food that is necessary for infant growth which boost immunity and help in reducing infections, they cannot access necessary healthcare as immunization that are important for infant and child survival.

The urban poor from households within low wealth quintiles cannot easily access safe water and have to pay for almost eight times more for water and thus increasing the risk of contamination because not all of them can afford safe water . The living conditions in poor and unhealthy urban settlements create acute health

vulnerabilities resulting to unhealthy living conditions; this is especially true for among vulnerable sub-groups infants and young children and it compromise their growth nutritionally, and in terms of psychomotor and cognitive abilities.

**Table 4.3: Results of multivariate Cox's regression for factors influencing infant mortality in urban Kenya**

Variable	Urban Kenya		
	B	S.E. (B)	Exp (B)
<b>Maternal Education</b>			
No education (RC)	0.000		1.000
Primary	.117	.311	1.124
Secondary+	.072	.348	1.075
<b>Work status</b>			
Currently working	0.000		1.000
Not working (RC)	-.271	.301	.763
<b>Household wealth quintile</b>			
First (RC)	0.000		1.000
Second	-1.689	1.101	.185***
Middle	-1.798	1.056	.166
Fourth	-.900	.716	.406
Highest	.229	.358	1.257
<b>Maternal Age at first birth (years)</b>			
Less 18 years (RC)	0.000		1.000
18 – 24 years	-.343	.452	.709
25 – 34 years	-.262	.385	.770
35 +	-.342	.246	.132
<b>Birth order</b>			
First birth (RC)	0.000		1.000
2 – 3	-.560	.444	.571**
4+	.256	.359	1.292
<b>Preceding birth interval</b>			
≤ 24 months (RC)	0.000		1.000
> 25 months	.457	.159	.891
<b>Type of toilet facility</b>			
Flush (RC)	0.000		1.000
Pit latrine	-.246	.288	.782
Other and no facility	.602	.764	1.826
<b>Source of drinking water</b>			
Safe water (RC)	0.000		1.000
Unsafe water	-.073	.412	.930

\*\*\*p<0.01,\*\*p<0.01,\*p<0.05 source: analysis 2008/9 KDHS

Furthermore, the findings also showed that birth order is a significant factor in influencing infant mortality in urban Kenya. Infants born to mothers at order 2-3 were 43% less likely to experience infant deaths compared to mothers who had infants at first birth. The results were not consistent with the literature reviewed and contribution from various studies on birth order. These studies (Kaldwei, 2010; Singh, 2013; Mustafa & Odimegwu, 2008; Kimani 2012), have shown that the risk of infant deaths increase with increase in birth orders. Infants born at first birth are highly likely to survive because they are likely to benefit more since there is no competition for resources, maternal and family care with other children and in most cases the mother is not physically depleted. While as births order increase, the risk of infant death is high as there is a tendency for competition of resources, maternal and family care and generally basic needs, these more than always affects infant growth and survival. Sometimes these infants are not breastfed because the health of the mother is depleted and maternal care is very minimal thus they tend to face serious health issues at infant stage as weight and growth issues.

However, several studies have established that in urban Kenya (Fotso , 2011; Alampay, 2008) that mothers with infants at first birth also face a high risk of infant mortality this is as a result of vulnerabilities they face such as low incomes making them unable to get basic needs sufficient to provide resources as nutritionally standard food, this has increased the prevalence of under nutrition which is at 35% , here a gap of poor and non-poor widens , prevalence among infants is around 57% in urban slums in Kenya and 28% in entire urban Kenya as a whole. Also, in urban Kenya public provision of health services is limited. Most hospitals are ram shackled clinics with no working guidelines and standard

protocols for services and most women seek these services only when infants get complications. Also infections and diseases especially communicable diseases and HIV/AIDS prevalence is higher in urban Kenya this is especially as a result of close living especially in most urban settlements this increases the risk of most mothers experiencing infant mortality.

However the study did not establish any significant association of infant mortality in urban Kenya with maternal education, work status, preceding birth interval, age at first birth, source of drinking water and type of toilet facility implying they are not determinants of infant mortality in urban Kenya. Thus it seems wealth quintile and birth orders are determinants of infant mortality in urban Kenya.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary, conclusion and recommendation of the study. The first section describes summary of findings, the second section presents conclusion and lastly recommendations are presented in the last section of the chapter.

#### 5.2 Summary of findings

This study set out to establish the factors influencing infant mortality in urban Kenya. The specific objectives were to establish the effect of socioeconomic, environmental and maternal factors on infant mortality. The study variables analyzed included maternal education, wealth quintile, work status, maternal age at first birth, preceding birth interval, birth order, source of drinking water and type of toilet. The data for the study was obtained from KDHS 2008/9. The study consisted of 1467 infants from urban Kenya.

The study was conceptualized within Mosley and Chen framework. The main methods of data analysis were descriptive statistics and Cox proportional hazard model. The preliminary analysis showed that the highest number of infant births were reported among mothers with primary level of education (47%), those mothers from household with highest wealth quintile (72%) and among mothers who had their first births at ages 18-24 (56%). Also, majority of births was noted among currently working mothers (53%) and those mothers who had infants at birth order 2-

3 and who had preceding birth intervals at more than 25 months at (44%) and (49%) respectively. Moreover mothers from households using pit latrines and households using safe water had highest births at (57%) and (84%) respectively.

The results of bivariate analysis showed that birth order and preceding birth interval were significantly associated with infant mortality in urban Kenya. The results of multivariate Cox's proportional hazard model showed that high risk of infant mortality was found among infants born to mothers from households within second level of wealth quintile in urban Kenya. Similarly higher risks were observed among mothers who had infants at second birth order.

The study did not establish any statistical significant relationship between infant mortality and maternal age at first birth, preceding birth interval, maternal education, source of water and type of toilet facility.

### **5.3 Conclusion**

Household wealth quintile and birth order are the main determinants of infant mortality in urban Kenya. Mothers within the second level of household wealth quintile are less likely to experience risk of infant mortality compared to mothers within the first level of wealth quintile implying households of low wealth quintile experience a high risk of infant mortality. Several studies (Kabbir & Uddin, 2006; Alampay, 2008 & Oxfam urban program, 2009), have established that infants born to mothers within low levels of wealth quintile have a high risk of experiencing infant mortality. This is due to low level of purchasing power which makes them unable to access basic needs which are often expensive in urban areas. Accessing food

necessary for infant growth, safe water, proper healthcare and healthy living conditions is a challenge for these households. Though this is not unique, other studies (Bocquier & Gunther, 2012, Fotso, 2007) have established that risk of infant mortality was higher among mothers within households of highest wealth quintile because instances of early weaning was common and it increased the risk of infants getting infections and also with reduced maternal care infants are prone to accidental infant deaths as choking due to improper care.

Also, birth order was found to be a significant factor in influencing infant mortality, women who had infants at birth order 2-3 were less likely to experience infant deaths as compared to those who had infants at first birth order, implying infants born in first birth order may experience a high risk of infant deaths. Several studies have established that in urban Kenya (Fotso, 2011; Alampay, 2008) even mothers who have infants at first birth face a high risk of infant mortality. This is as a result of vulnerabilities they face such as low incomes making them unable to get basic needs sufficient to provide resources as nutritionally standard food, this has increased the prevalence of under nutrition which is at 35% , here a gap of poor and non-poor widens , prevalence among infants is around 57% in urban slums in Kenya and 28% in entire urban Kenya as a whole. Also, in urban Kenya public provision of health services is limited. Most hospitals are ram shackled clinics with no working guidelines and standard protocols for services and most women seek these services only when infants get complications. Also infections and diseases especially communicable diseases and HIV/AIDS prevalence is higher in urban Kenya this is especially as a result of close living especially in most urban settlements this increases the risk of most mothers experiencing infant mortality.



However the above is unexpected ,other studies have found ((Kaldwei, 2010; Singh, 2013; Mustafa & Odimegwu, 2008; Kimani 2012),that high birth order are associated with infant mortality and increase in birth order increased the risk of infant mortality First births were less likely to experience infant deaths because they were likely to capture maternal care and economic advantage, while those of order three and above could have mothers who are physically depleted and faced competition for resources with other older siblings.

Thus wealth quintile and birth order are determinants of infant mortality in urban Kenya and other variables were not. Other studies have established the dynamics governing factors influencing infant mortality in urban Kenya. Rajaretnam et al(2010) documented recent declines in infant mortality and have tracked that changes in infant survival in most urban areas is attributed to particular interventions as change in immunization patterns and access to safe water and toilet facilities. This implies that over the years factors influencing infant mortality in urban Kenya have been changing due to improved interventions and new policies measures.

#### **5.4 Recommendations**

This section presents the recommendations emanating from the study finding both for policy and further research. This was discussed in regard to study findings.

##### **5.4.1 Recommendations for policy makers**

This study indicates that wealth index and birth order were the main determinants of infant mortality in urban Kenya. The main policy implication is need for the National Urban Development Policy to be rolled out in all urban areas in Kenya..

The National Urban Development Policy long term goal is to accelerate economic growth, promote equity and reduce poverty at household level in urban Kenya. This will be achieved by training and encouraging citizen participation by key vulnerable sub-groups as women and youth in various interventions as establishment of sustainable income generating activities and formation of saving schemes. This would help in providing information and skills that will enable them improve their status of wealth quintile at household level.

Finally, there is need to develop and implement an effective incentive and strategy to attract other public and private sector stakeholders on poverty reduction interventions.

#### **5.4.2. Recommendations for further Research**

More research should be conducted in urban Kenya on infant mortality in specific urban settings as slums, non-slum and peri-urban areas since they have different mortality rates and could be having different variables that influence mortality differently, thus have data classified into the different categories. Also, further research should be conducted using other methodologies as qualitative studies in urban areas on infant mortality so as to explore actual causes leading to infant mortality. Also this study used quantitative data thus it will be suitable to use qualitative method because they could show other factors influencing infant mortality in urban Kenya.

## REFERENCES

- Abuya Benta. 2007. "Influence of Maternal Education on child health in Kenya, Education, theory and policy," Unpublished thesis Pennsylvania State University ,Pennsylvania: 2007 pp 3-5
- Aguirre Guido Pinto.2005. "Child Mortality and Reproductive patterns in Urban Bolivia" CDE working paper NO: 95-98 University of Wisconsin-Madison Centre for Demography and ecology, Wisconsin 2005: pp 6-8
- Agwanda Alfred, Anne Khasakhala, George Odwe, Imbwanga Andrew and Z.Iyga .2012. "Mortality Decline in Kenya: In search of explanation" a working paper at the Population Studies and Research Institute, University of Nairobi.
- Alampay,R. 2008. "Our cities, our health and our future" *A synopsis of the report of the knowledge network on urban settings to the World Health Organization commission on social determinants of health.* World Health Organization press for health development, Kobe, Japan.2008: pp 4-12.
- Bocquier, P.& Gunther,L.2012. "Is there an urban advantage in child survival in sub-saharan Africa? Evidence from 18 countries." *Population and Development review*, New York.
- Cox, D.R.1972. "Regression Models and Life tables" .Journal of Royal Statistical Society .Series B34:187-202.
- De Klerk, N.S. Poerwanto and M. Stevenson. 2003. "Infant mortality and family welfare: Policy implication for Indonesia". *Public health policy and practice for Indonesia*, published in Indonesia 2003: pp 45
- Desta Mekonina .2012. "Infant and child mortality in Ethiopia, role of socioeconomic, demographic and biologic factors in the previous five year period 2000-

- 2005"unpublished thesis Lund University, Department of Economic history, Ethiopia, 2012: pp 4-7.
- Ettarh, R.& J. Kimani. 2012. "Determinants of under-five mortality in rural and urban Kenya", Rural and remote health journal Africa, population health and research center. 2012:1812: pp 2-4.
- Fotso, J. C. 2007. "Urban-rural differentials in child malnutrition: Trends and socioeconomic correlates in sub-Saharan Africa" *Health and place 13* published by African population and health research, (1): pp 205-223.
- Fotso, J. C. 2011. "Maternal and child Health services for urban poor a case study from Nairobi Kenya between 2006-2009" published by African Population and Health Research, Nairobi *vol 2*: pp 67-68.
- Gyrsong Akile.1994. "Forum: Parental education and child mortality" *Health transition review department of international relations*, University of Marmara, Turkey. Unpublished PhD thesis.
- Greene, M. And Gakusi, E. 2005. "Public policies and health outcomes: Evidence from Sub-Saharan Africa since 1960." *A paper submitted on IUSSP conference in Nairobi, Kenya.*
- Institute of Surveyors, The National Urban Development Policy (NUDP).2012. "Making process the Kenyan way: Big challenges and some opportunities." Published by Institute of Surveyors, Nairobi
- Kaldewei Cornalia .2010. "Determinants of Infant and under five mortality –case of Jordan" *a technical note submitted at the IUSSP conference in Jordan, Jordan State.*
- K' Oyugi, B.O.2000. "The Impact of Environmental factors on infant and child mortality in Rural Kenya" in Oucho. J.O. Ocholla-Ayayo, ABC, Ayiembra

- E.H.O and Omwanda L.O (edits) *Population and Development in Kenya*, Population Studies and Research Institute, University of Nairobi.
- Lee, R. 2003. “The Demographic Transition: Three centuries of fundamental care”, *Journal of Economic Perspective –volume 17, number 4 Fall -2003* pp: 167-190.
- Madise, N. and I, Diamond.1995. “Determinants of infant mortality in Malawi: Analysis to control foetal deaths clustering with families” *Journal of biosocial science, 27(1):95-106*, Lilongwe free press.
- Magoha, G.2012. “Life expectancy in twelve countries in Africa”. *A technical paper submitted at the School of Medicine*, University of Nairobi.
- Measure Learning and Evaluation, (MLE) project 2010. United Nations Carolina Population Centre, State of Carolina.
- Mosley, W. & L. Chen. 1984. “An analytical framework for the study of child survival in developing countries”, *Population and development review, 1984, 10(supplement):* pp 25-45.
- Muganzi, Z. 2000. “Factors affecting infant and child mortality in Kenya” In Oucho. J. O, Ocholla-Ayayo, ABC, Ayiemba. E.H.O and Omwanda L.O (edits), *Population and Development in Kenya*, Population Studies and Research Institute, University of Nairobi.
- Murage Kimani, Fotso, J. Egandi T and Abuya Benta.2012. “Trends in child mortality: Does the urban advantage still hold?” Published by African Population and Health Research Institute Nairobi, Kenya.
- Mutunga, C. J. 2007 “Environmental Determinants of infant mortality in Kenya,” *United Nations University research paper No.2007/83* UNU-WIDER printers, Helsinki-Finland.

- Mustafa, H. E and C. Odimwengu, 2008. "Socioeconomic determinants of infant mortality in Kenya; Analysis of KDHS 2003," *Journal of Humanities and Social sciences*, Vol 2. Issue 2:2008:7-13.
- National Council for Population and Development, 2012. (NCPD). Population Policy for National Development Sessional Paper No.3. NCPD Nairobi.
- Ollivola Ken, 2005. "Health of children living in urban slums in Asia and Near East: Review of existing literature and data", *Environmental health project, Activity report 109, prepared for Asia and Near East Bureau of USAID*, Washington DC. 20523:2005:19-20.
- Oladeji, D. and Abe, K.2013. "Child survival and birth spacing practices in Nigeria." *Journal of maternal and child health*, Lagos, Nigeria, 2013: pp 57.
- Oxfam Urban Program, 2009. *A Report on Poverty differentials in urban Kenya*, Oxfam, Nairobi.
- Pebley, A. R. and P. W. Stupp, 1987. "Reproductive patterns and child mortality in Guatemala", Guatemala inc. publishers, 24 (1): 43-60.
- Radelet, S. 2010. "Emerging Africa: how 17 countries are leading the way". Baltimore, Maryland: printed at the Centre for Global Development. 2010: pp 4.
- Rajaratnem, J. K, J. R Marcus, A. D Flaxman, A.D Lopez and C .J. L, Murray.2010. "Neonatal, post neonatal, childhood and under five mortality for 187 countries", 1970-2010: *a systematic analysis of progress towards Millennium Development Goal Four*. The Lancet 375(9730) June: 1988-2008.
- Rustein, S.O .2008. "Further evidence of the effects of preceding birth intervals on neonatal, infant and under five years mortality and nutritional status in

- developing countries” *Evidence from DHS Demographic and Health Research Division*, Macro International inc.1178, Calverton, USA.
- Singh Abishek.2013. “Explaining the rural-urban gap in infant mortality in India” *Research article, a peer –reviewed, open access journal of Population Science*, New Delhi .2013: pp 112.
- Republic of Kenya, 2013. *The National Slum Upgrading and Prevention Policy* .2013. Ministry of Housing, Nairobi.
- Tromenova Sophia & Demombyanes Gabriel. 2012. “What has driven the decline of infant mortality in Kenya?”*Policy research working paper 6057*, published by *World Bank, African Region, poverty reduction and economic management unit*, Nairobi office, Kenya.
- United Nations (UN) Department of Economic and social Affairs, Population Division, 2007. *World Population prospects, 2006 Revision, volume 1: comprehensive tables*. New York: UN (publication.E.07) Accessed 2007.
- Uddin Giash and Kabir M. 2006. “Factors associated with child health in urban areas of Bangladesh,” working paper at the University of Jagannath, Department of Demography and statistics, Dhaka, Bangladesh 2006:6-8.
- Wangila, S. 2012. “The upsurge in infant and child mortality in Kenya during 1988-2003 periods: levels and Determinants” unpublished PhD thesis at the Population Studies and Research Institute, University of Nairobi: pg 44-45.
- Weisz, G. and Jesse Olszynko-ryn, 2009.“The theory of Epidemiological transition origins of a citation classic”, Department of history and Philosophy, University of Cambridge, Cambridge: pp 1-5.